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LISTS OF SPECIES

# Checklist of rocky reef fishes from the Currais Archipelago and Itacolomis Island, Paraná state, Brazil

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**ABSTRACT:** The ichthyofauna of the rocky substrate of Currais Archipelago and Itacolomis Island (Paraná state, Brazil) was surveyed between October 2008 and August 2009 through visual census, using 40 m² (20x2 m) band transects at an average depth of 6 m. A total of 14,210 individuals (66 species from 33 families) were observed in 336 band transects, covering an area of 13,440 m². *Stegastes fuscus*, *Abudefduf saxatilis*, *Haemulon aurolineatum* and *Malacoctenus delalandii* were the most abundant species. "Carnivore" was the most species-rich category, and "Mobile Invertebrate Feeder" the most abundant. Nine species are added to the list of reef fishes of the Paraná state: *Acanthurus coeruleus*, *Dactylopterus volitans*, *Epinephelus morio*, *Myrichthys breviceps*, *Ophioblennius trinitatis*, *Paraclinus spectator*, *Scorpaena brasiliensis*, and *Selene vomer*.

## INTRODUCTION

Reefs are defined as any formation with a consolidated bottom of organic and/or inorganic origin and they are extremely rich in terms of biodiversity and form one of the most complex environments in the coastal marine ecosystem. It is estimated that reefs harbor about 25% of all species of marine fishes currently known (Spalding *et al.* 2001). Fish communities have the highest levels of diversity in reefs, though such diversity may vary according to geographic and morphologic conditions of the ecosystem (Sale 1991). In Brazil, it is estimated that about 520 species inhabit this ecosystem (Hostim-Silva *et al.* 2006). Those species display a plethora of colors, shapes, trophic and reproductive habits, and present a variety of intra- and interspecific associations.

Rocky shore support diverse fish communities despite having lower topographic complexity than coral reefs, and are the main habitat for the reef biota in southern Brazil (Ferreira *et al.* 2001). Consolidated substrates such as those typically present in coastal islands, rocky shores, submerged slabs and calcareous bottoms are uncommon in the coast of Paraná State, southern Brazil. It is possible that the almost complete inexistence of such rock formations in the coast line of Paraná might be related to the relatively large distance of the Serra do Mar, where the rocky formations are found. The Currais Archipelago and Itacolomis Island are ecologically relevant among the marine ecosystems of the Paraná State since they supply suitable conditions for communities whose components are more adapted to living in reef habitats.

Despite its relevance to the marine biota, few studies have been performed to date in these islands (Félix and Harckradt 2008; Félix-Hackradt and Hackradt 2008; Harckradt and Félix-Harckradt 2009). Many studies that deal with the fish fauna have been carried out on the Paraná coast, but the main focus of those studies was usually the ichthyofauna associated with unconsolidated substrate (*e.g.* Godefroid *et al*. 2001; Vendel *et al*. 2003; Spach *et al*. 2004; Félix *et al.* 2007). In order to contribute to the knowledge of this particular component of the ichthyofauna, a list of the fish species known to occur in the rocky substrates of the Currais Archipelago and Itacolomis Island is provided.

## MATERIALS AND METHODS

### *Study site*

The Currais Archipelago (25°44' S, 48°22' W) is composed of three islands separated by 6 nautical miles from the coast. The depth along the archipelago varies from 1.5 to 16 m. Itacolomis Island (25°50' S, 48°24' W) consists of two small rocky islands located approximately 7 nautical miles from the coast, with depths ranging from 3 to 17 m (Figure 1). The inclination of the rocky shores of Currais Archipelago and Itacolomis Islands is moderate, between 45° and 60°. The substrate is composed mostly of small rocks, which are usually covered by macroalgae, *Palythoa* sp., and *Zoanthus* sp.

### *Data collection*

Data were collected using underwater visual census (UVC) on strip transects (Floeter *et al*. 2007). Observations were conducted monthly, from October 2008 to August 2009, from 07:00 a.m. to 03:00 p.m. A total of 336 strip transects of 40 m² (20x2 m) each were analyzed, 168 on each site: two in Currais Archipelago and two in Itacolomis Island (Figure 1), using SCUBA gear in depths that ranged from 3 to 9 m. The total area covered in the study was 13,440 m².

Species were identified with the use of keys and descriptions provided by Figueiredo and Menezes (1980), Menezes and Figueiredo (1980, 1985), Randall (1996), Humann and Deloach (2002), Hostim-Silva *et al*. (2006), Craig and Hastings (2007), and Baldwin *et al.* (2009). For the genus *Kyphosus*, the differentiation between the two

species, *K. incisor* and *K. sectator*, is possible only with the capture of specimens for counting spines of the dorsal and anal fins; thus the specimens observed were identified until the taxonomic level of genus. The species of reef fishes were grouped in six trophic categories assessed from the literature (Ferreira *et al*. 2004; Randall 1967; Opitz 1996; Floeter *et al*. 2004, 2006; Kuiter 2009), where: CAR = Carnivores (eat a variety of mobile organisms, including invertebrates and fishes), MIF = Mobile Invertebrate Feeders (feed primarily on small benthic mobile invertebrates like mollusks, crustaceans, worms, etc. associated to the hard- or nearby soft-substrate), OMN = Omnivores (feed on a variety of organisms, both animal and vegetal), PLA = Planktivores (feed primarily on macro- and micro-zooplankton), HER = Herbivores (small to large herbivores that include in their diet a rich mass of detritus, turf algae and macroalgae) and SIF = Sessile Invertebrate Feeders (feeds on a array of sessile benthic invertebrates like cnidarians, bryozoans, ascidians and sponges that are mostly associated with hard substrate).

In order to analyze their zoogeographic affinities, the species were classified using the literature (Luiz-Jr *et al*, 2008) into the following geographic distribution categories: Br = Brazilian province; CE = Central Atlantic (St. Helena and Ascension Islands); CT = Circumtropical, EA= Eastern Atlantic, Pat = Patagonian (occur primarily in the temperate rocky reefs south to Argentina), SCa = Southern Caribbean (coast of Venezuela, Trinidad and Tobago and other islands of the low Lesser Antilles), SE = Southeastern Brazil (endemic from the region that encompass 20° to 27°S), TA = Trans-Atlantic (both sides of the Atlantic Ocean), and WA = Western Atlantic (in the western North and South Atlantic).

## Results and Discussion

Throughout this study, 14,210 individuals of 66 species in 33 families and 8 orders, were observed (Table 1). In the Currais Archipelago, 6,115 specimens (48 species in 30 families) were observed, with an average density of 36.4/40 $m^2$. On Itacolomis Island, 8,095 specimens were observed (51 species in 26 families), with an average density of 48.2/40 $m^2$.

The families Blenniidae, Carangidae, Epinephelidae, Haemulidae, and Pomacentridae were those with the largest number of species observed (five each). *Stegastes fuscus*, *Malacoctenus delalandii*, *Parablennius marmoreus*, and *Abudefduf saxatilis* were the most frequent species observed during the study (98.8, 86.0, 56.5 and 48.2%, respectively), while *S. fuscus* (n=3,929), *A. saxatilis* (n=2,694), *Haemulon aurolineatum* (n=2,529), *M. delalandii* (n=1,676) were the most numerous (Figure 2).

Most of the individuals observed belong to species whose maximum known TL are around 10 centimeters. Another factor that possibly contributed to this result is the ontogenetic migration of some species, such as *Mycteroperca marginata* (Machado *et al*. 2003). In that species and possibly in others among those identified in this study, smaller individuals are found in shallower depths, whereas the larger ones look for refuges at deeper sites, thus decreasing the competition for space and food.

The 66 species identified in this study were grouped in the six trophic categories described above, which can be used as categories of convenience in studies about interactions between species. About 32% (21 species) are Carnivores. Mobile Invertebrate Feeders is the second largest category, with 26% (17) of the species identified. The other categories are Herbivores, Omnivores, Planktivores, and Sessile Invertebrate Feeders (12, 9, 5, and 2 species, respectively), together contributed with 42% of the species identified. Carnivores are more representative at high latitudes, due to a decrease in herbivores and mobile invertebrate feeders (Ferreira *et al*., 2004). The diversity of the mobile invertebrate feeders, and the consequently diversified ecomorphological types, make such group prone to be abundant in different environmental conditions (Ferreira *et al*. 2004).

Fifty-nine percent of the species (39) occur throughout the Western Atlantic, 22.7% (15) are Trans-Atlantic, and 10.6% (7) are endemic to the Brazilian coast. Species that occur in the Central-Atlantic and Southeastern Brazil contribute with 6.0% (4) and 1.5% (1), respectively.

*Ophioblennius trinitatis*, *Selene vomer*, *Dactylopterus volitans*, *Paraclinus spectator*, *Myrichtys breviceps*, *Scorpaena brasiliensis*, *Epinephelus morio* (Figure 3A) and *Acanthurus coeruleus* (Figure 3B) are species known to occur in southern Brazil (Hostim-Silva *et al*., 2006; A. A. Bertoncini, unpubl. data), but during this study they were observed for the first time in association with rocky substrates in the Paraná State and should be added to the regional list provided by Hackradt and Félix-Harckradt (2009).

A juvenile of *Anisotremus virginicus*, which is an optional cleaner during this phase, was observed cleaning an adult of *Chaetodon striatus* for 3 minutes (Figure 4). This interaction represents a cleaning symbiosis in which one species of fish removes parasites and necrotic tissue or mucus from a variety of fish seeking services.

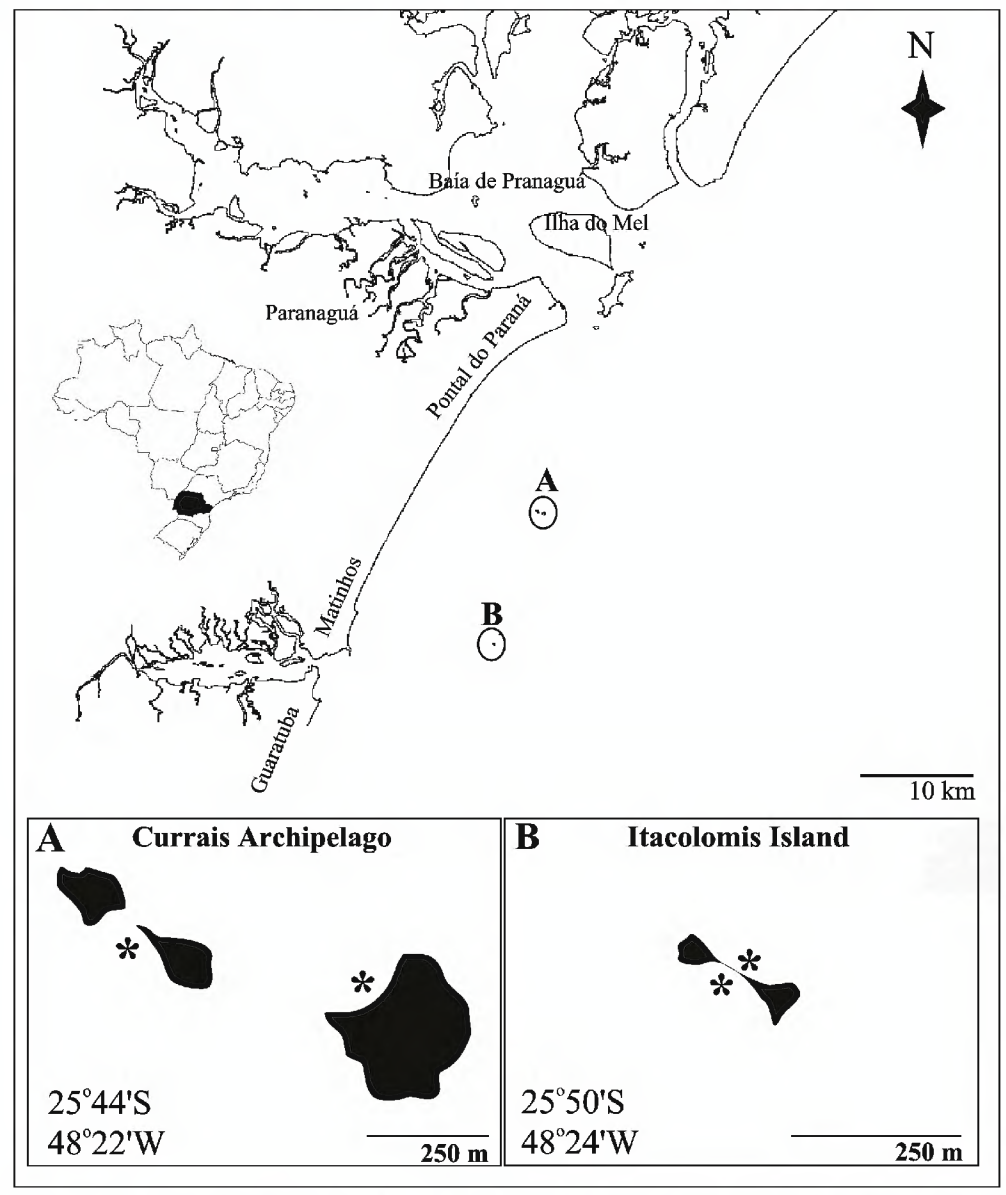


**Figure 1.** Paraná coast. (A) Currais Archipelago and (B) Itacolomis Island.

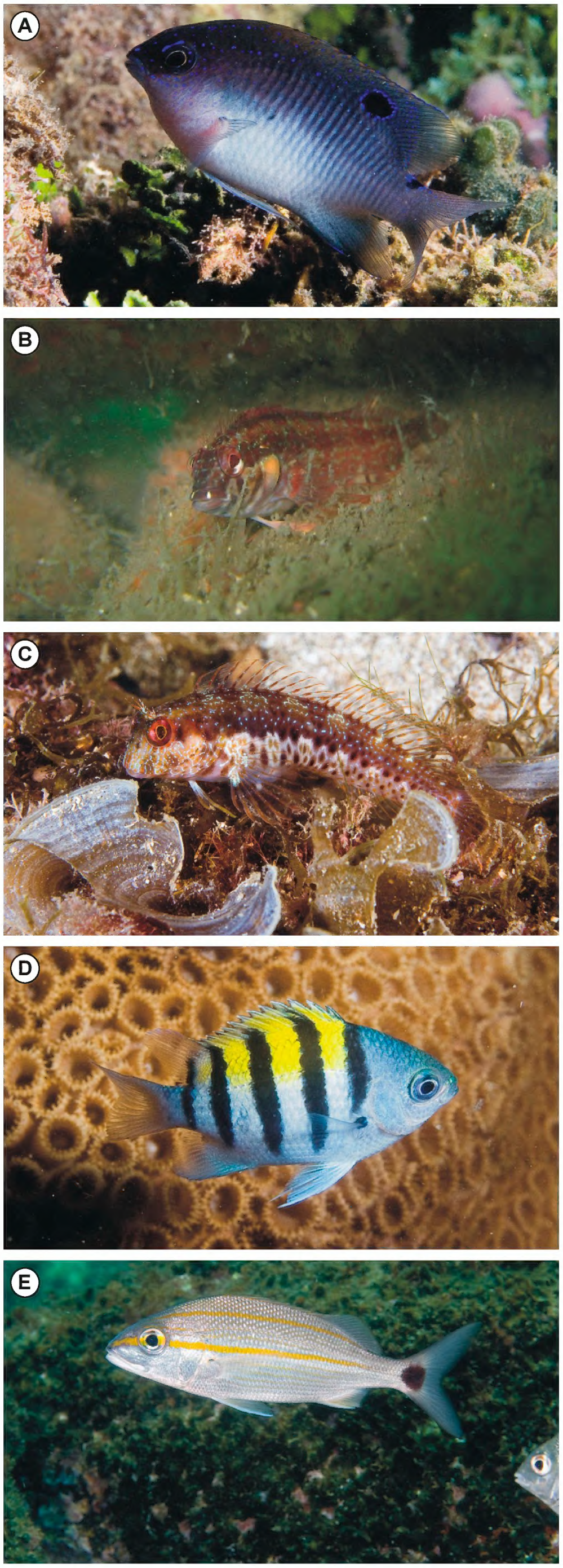


**FIGURE 2.** Species more frequent and abundant observed in the study: (A) *Stegastes fuscus*; (B) *Malacoctenus delalandii*; (C) *Parablennius marmoreus*; (D) *Abudefduf saxatilis*; and (E) *Haemulon aurolineatum*. Photos A, C, D, and E by Athila Bertoncini. Photo B by Felippe Daros.

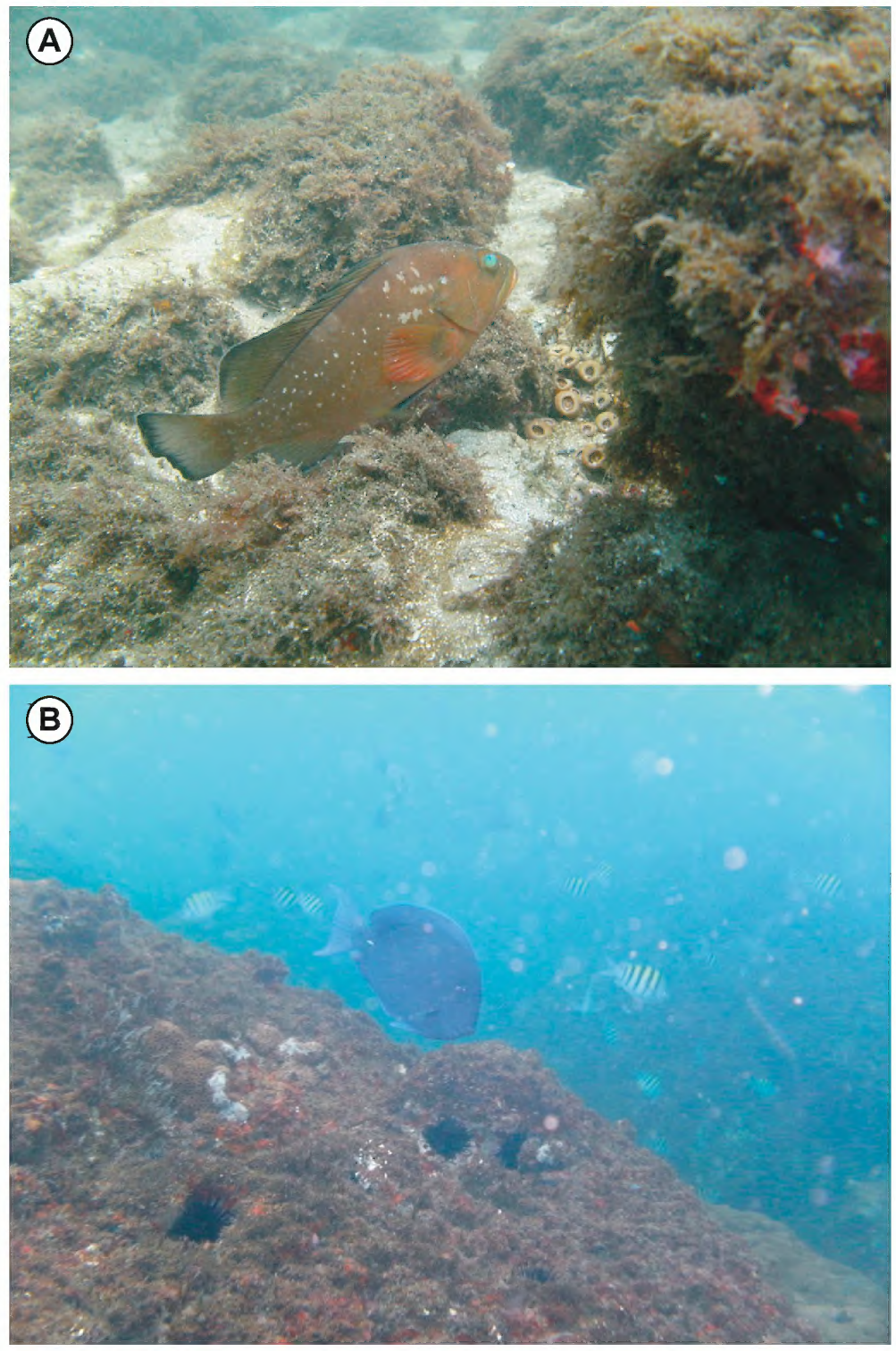


**FIGURE 3.** *Epinephelus morio* (A) in the Currais Archipelago and *Acanthurus coeruleus* (B) in the Itacolomis Island. Photos by Felippe Daros.

**FIGURE 4.** Cleaning station observed in the Currais Archipelago. *Anisotremus virginicus* and *Chaetodon striatus*. Photo by Felippe Daros.

**Table 1.** Abundance of species of fishes in the Currais Archipelago and Itacolomis Island. Classification follows Nelson (2006). Trophic categories: CAR, carnivore; HER, herbivore; ONI, omnivore; MIF, mobile invertebrate feeder; SIF, sessile invertebrate feeder; PLA, planktivore. Geographic range: Br, Brazilian province; CE, Central Atlantic; CT, Circumtropical; EA, Eastern Atlantic; Pat, Patagonian; SCa, Southern Caribbean; SE, Southeastern Brazil; TA, Trans-Atlantic; WA, Western Atlantic.

| LIST OF SPECIES | CURRAIS (N) | ITACOLOMIS (N) | TROPHIC CATEGORIES | GEOGRAPHIC RANGE |
|---|---|---|---|---|
| CHONDRICHTHYES | | | | |
| Myliobatiformes | | | | |
| Myliobatidae | | | | |
| *Aetobatus narinari* (Euphrasen, 1790) | | 1 | CAR | CT |
| ACTINOPTERYGII | | | | |
| Anguilliformes | | | | |
| Muraenidae | | | | |
| *Gymnothorax funebris* Ranzani, 1839 | 1 | 2 | CAR | WA |
| *Gymnothorax moringa* (Cuvier, 1829) | 5 | 2 | CAR | WA+CE |
| *Gymnothorax vicinus* (Castelnau, 1855) | 1 | 4 | CAR | TA |
| Ophichthidae | | | | |
| *Myrichthys breviceps* (Richardson, 1848) | 1 | | MIF | WA |
| Synodontidae | | | | |
| *Synodus synodus* (Linnaeus, 1758) | | * | CAR | TA |
| Beryciformes | | | | |
| Holocentridae | | | | |
| *Holocentrus adscensionis* (Osbeck, 1765) | 26 | 75 | MIF | TA |
| Gasterosteiformes | | | | |
| Sygnathidae | | | | |
| *Micrognathus crinitus* (Jenyns, 1842) | 1 | | MIF | WA |
| Fistulariidae | | | | |
| *Fistularia tabacaria* Linnaeus, 1758 | 1 | | CAR | TA |
| Scorpaeniformes | | | | |
| Dactylopteridae | | | | |
| *Dactylopterus volitans* (Linnaeus, 1758) | * | | MIF | TA |
| Scorpaenidae | | | | |
| *Scorpaena brasiliensis* Cuvier, 1829 | | 2 | CAR | WA |
| Perciformes | | | | |
| Serranidae | | | | |
| *Diplectrum radiale* (Quoy and Gaimand, 1824) | 1 | | CAR | WA |
| *Serranus flaviventris* (Cuvier, 1829) | 110 | 56 | MIF | WA |
| Epinephelidae | | | | |
| *Epinephelus morio* (Valenciennes, 1828) | * | | CAR | WA |
| *Hyporthodus niveatus* (Valenciennes, 1828) | 1 | 4 | CAR | WA |
| *Mycteroperca acutirostris* (Valenciennes, 1828) | 37 | 14 | CAR | WA |
| *Mycteroperca bonaci* (Poey, 1860) | 1 | | CAR | WA |
| *Mycteroperca marginata* (Lowe, 1834) | 7 | 16 | CAR | SE+Pat+EA |
| Priacanthidae | | | | |
| *Priacanthus arenatus* Cuvier, 1829 | * | | CAR | TA |
| Carangidae | | | | |
| *Carangoides crysos* (Mitchill, 1815) | 1 | 6 | CAR | TA |
| *Caranx latus* Agassiz, 1831 | | 1 | CAR | TA |
| *Chloroscombrus chrysurus* (Linnaeus, 1766) | 8 | 20 | PLA | TA |
| *Pseudocaranx dentex* (Bloch and Schemeider,1801) | 115 | 49 | PLA | CT |
| *Selene vomer* (Linnaeus, 1758) | | 1 | CAR | WA |
| Lutjanidae | | | | |
| *Lutjanus analis* (Cuvier, 1828) | 2 | | CAR | WA |
| Haemulidae | | | | |
| *Anisotremus surinamensis* (Bloch, 1791) | 27 | 31 | MIF | WA |
| *Anisotremus virginicus* (Linnaeus, 1758) | 135 | 103 | MIF | WA |
| *Haemulon aurolineatum* Cuvier, 1830 | 1745 | 784 | PLA | WA |
| *Haemulon stendachneri* (Jordan and Gilbert, 1882) | 5 | 1 | MIF | WA |
| *Orthopristis ruber* (Cuvier, 1830) | 22 | 4 | MIF | WA |
| Sparidae | | | | |
| *Archosargus probatocephalus* (Walbaum, 1792) | | 1 | OMNI | WA |

**Table 1.** ***Continued.***

| LIST OF SPECIES | CURRAIS (N) | ITACOLOMIS (N) | TROPHIC CATEGORIES | GEOGRAPHIC RANGE |
|---|---|---|---|---|
| *Diplodus argenteus* (Valenciannes, 1830) | 23 | 45 | MIF | WA |
| Sciaenidae | | | | |
| *Odontoscion dentex* (Cuvier, 1830) | 381 | 361 | CAR | WA |
| *Pareques acuminatus* (Bloch and Schemeider, 1801) | 52 | 77 | MIF | WA |
| Mullidae | | | | |
| *Pseudupeneus maculatus* (Bloch, 1793) | 46 | 19 | MIF | WA |
| Pempheridae | | | | |
| *Pempheris schomburgkii* Muller andTroschel, 1848 | 6 | 11 | PLA | WA |
| Kyphosidae | | | | |
| *Kyphosus* sp. | 10 | 130 | HER | TA |
| Chaetodontidae | | | | |
| *Chaetodon striatus* Linnaeus, 1758 | 95 | 26 | SIF | WA |
| Pomacanthidae | | | | |
| *Pomacanthus paru* (Bloch, 1787) | 4 | 2 | OMNI | WA |
| Pomacentridae | | | | |
| *Abudefduf saxatilis* (Linnaeus, 1758) | 797 | 1897 | OMNI | CT |
| *Chromis multilineata* (Guichenot, 1853) | | 2 | PLA | TA |
| *Stegastes fuscus* (Cuvier, 1830) | 1521 | 2408 | HER | BR |
| *Stegastes pictus* (Castelnau, 1855) | * | | HER | BR+SCa |
| *Stegastes variabilis* (Castelnau, 1855) | 4 | 4 | HER | WA |
| Labridae | | | | |
| *Bodianus rufus* (Linnaeus, 1758) | | 4 | MIF | WA |
| *Halichoeres poeyi* (Steindachner, 1867) | 6 | 2 | MIF | WA |
| Scaridae | | | | |
| *Sparisoma amplum* (Ranzani, 1841) | | 1 | HER | BR |
| *Sparisoma axillare* (Steindachner, 1878) | 11 | 9 | HER | BR |
| *Sparisoma frondosum* (Agassiz, 1831) | 5 | 4 | HER | BR+SCa |
| *Sparisoma radians* (Valenciennes, 1840) | | 1 | HER | WA |
| Blenniidae | | | | |
| *Hypsoblennius invemar* Smith-Vaniz and Acero-P., 1980 | | 3 | OMNI | WA |
| *Ophioblennius trinitatis* Miranda Ribeiro, 1919 | | 1 | HER | BR |
| *Parablennius marmoreus* (Poey, 1876) | 121 | 306 | OMNI | WA |
| *Parablennius pilicornis* (Cuvier, 1829) | 8 | 35 | OMNI | TA |
| *Scartella cristata* (Linnaeus, 1758) | 4 | 5 | OMNI | CT |
| Labrisomidae | | | | |
| *Labrisomus nuchipinnis* (Quoy and Gaimand, 1824) | 2 | 20 | CAR | TA |
| *Malacoctenus delalandii* (Valenciennes, 1836) | 354 | 1322 | MIF | WA |
| *Paraclinus spectator* Guimarães and Bacellar, 2002 | 3 | | MIF | BR |
| Gobiidae | | | | |
| *Coryphopterus glaucofraenum* Gill, 1863 | 348 | 26 | PLA | WA |
| Ephippidae | | | | |
| *Chaetodipterus faber* (Broussonet, 1782) | 5 | | OMNI | WA |
| Acanthuridae | | | | |
| *Acanthurus bahianus* Castelnau, 1855 | 10 | | HER | WA |
| *Acanthurus chirurgus* (Bloch, 1787) | 5 | 184 | HER | TA |
| *Acanthurus coeruleus* Bloch and Schneider, 1801 | | * | HER | WA |
| Scombridae | | | | |
| *Scomberomorus brasiliensis* Collette, Russo and Zavala-Camin, 1978 | 4 | 2 | CAR | WA |
| TETRAODONTIFORMES | | | | |
| Monacanthidae | | | | |
| *Stephanolepis hispidus* (Linnaeus, 1766) | 1 | 1 | OMNI | TA |
| Tetraodontidae | | | | |
| *Sphoeroides spengleri* (Bloch, 1785) | 36 | 10 | SIF | WA |

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**Literature Cited**

Craig, M.T. and P.A. Hastings. 2007. A molecular phylogeny of the groupers of the subfamily Epinephelinae (Serranidae) with a revised classification of Epinephelini. *Ichthyological Research* 54:1-17.

Félix, F.C., H.L. Spach, P.S. Moro, R. Schwarz-Jr., C. Santos, C.W. Hackradt and M. Hostim-Silva. 2007. Utilization patterns of surf zone inhabiting fish from beaches in Southern Brazil. *Pan-American Journal of Aquatic Sciences* 2(1): 27-39.

Félix, F.C. and C.W. Hackradt. 2008. Interaction between *Rachycentron canadum* and *Epinephelus itajara*, on the Paraná coast, Brazil. *Coral Reefs* 27(3): 633.

Félix-Hackradt, F.C. and C.W. Hackradt. 2008. Estudo populacional e monitoramento do mero, *Epinephelus itajara* (Lichtenstein, 1822), no litoral do Paraná, Brasil. *Natureza & Conservação* 6(2): 31-46.

Ferreira, C.E.L., J.E.A. Gonçalves and R. Coutinho. 2001. Community structure of fish and habitat complexity on a tropical rocky shore. *Environmental Biology of Fishes* 61: 353-369.

Ferreira, C.E.L., S.R. Floeter, J.L. Gasparini, B.P. Ferreira and J.C. Joyeux. 2004. Trophic structure patterns of Brazilian reef fishes: a latitudinal comparison. *Journal of Biogeography* 31: 1093-1106.

Figueiredo, J.L. and N.A. Menezes. 1980. *Manual de peixes marinhos do sudeste do Brasil. III Teleostei (2)*. São Paulo: Museu de Zoologia, Universidade de São Paulo, 90 p.

Floeter, S.R., C.E.L. Ferreira, A. Dominici-Arosemena and I.R. Zalmon. 2004. Latitudinal gradients in Atlantic reef fish communities: trophic structure and spatial use patterns. *Journal of Biology* 64: 1680-1699.

Floeter, S.R., B.S. Halpern and C.E.L. Ferreira. 2006. Effects of fishing and protection on Brazilian reef fishes. *Biological Conservation* 128: 391-402.

Floeter, S.R., W. Krohling, J.L. Gasparini, C.E.L. Ferreira and I.R. Zalmon. 2007. Reef fish community structure on coastal islands of the southeastern Brazil: the influence of exposure and benthic cover. *Environmental Biology of Fishes* 78: 147-160.

Godefroid, R.S., C. Santos, M. Hofstaetter and H.L. Spach. 2001. Occurrence of larvae and juveniles of *Eucinostomus argenteus*, *Eucinostomus gula*, *Menticirrhus americanus*, *Menticirrhus littoralis*, *Umbrina coroides* and *Micropogonias furnieri* at Pontal do Sul beach, Paraná. *Brazilian Archives of Biology and Technology* 44(4): 411-418.

Hackradt, C.W. and F.C. Félix-Hackradt. 2009. Assembleia de peixes associados a ambientes consolidados no litoral do Paraná, Brasil: uma análise qualitativa com notas sobre sua bioecologia. *Papéis Avulsos de Zoologia* 49(31): 389-403.

Hostim-Silva, M., A.A. Bertoncini, L.F. Machado, L.C. Gerhardinger, F.A. Daros, J.P. Barreiros and E.A.S. Godoy. 2006. *Peixes de costão rochoso de Santa Catarina: I. Arvoredo*. Itajaí: Universidade do Vale do Itajaí, 134 p.

Humann, P. and N. Deloach. 2002. *Reef fish identification: Flórida, Caribbean, Bahamas.* 3rd. ed. Jacksonville: New World Publications, 481 p.

Kuiter, R.H. 2009. *Seahorses and their relatives*. Aquatic Photographics Publications, Australia, 337 p.

Luiz-Jr, O., A. Carvalho-Filho, C.E.L. Ferreira, S.R. Floeter, J.L. Gasparini and I. Sazima. 2008. The reef fish assemblage of the Laje de Santos Marine State Park, Southwestern Atlantic: annotated checklist with comments on abundance, distribution, trophic structure, symbiotic associations, and conservation. *Zootaxa* 1807: 1-25.

Machado, L.F., A.A. Bertoncini, M. Hostim-Silva and J.P. Barreiros. 2003. Habitat use by the juvenile dusky grouper *Epinephelus marginatus* and its relative abundance, in Santa Catarina, Brazil. *Journal of Ichthyology* 6(4): 133-138.

Menezes, N.A. and J.L. Figueiredo. 1980. *Manual de peixes marinhos do sudeste do Brasil. IV. Teleostei (3).* São Paulo: Museu de Zoologia, Universidade de São Paulo, 96 p.

Menezes, N.A. and J.L. Figueiredo. 1985. *Manual de peixes marinhos do sudeste do Brasil. V. Teleostei (4).* São Paulo: Museu de Zoologia, Universidade de São Paulo, 105 p.

Nelson J.S. 2006. *Fishes of the world.* 4th ed. New York: John Wiley & Sons, Inc. 601 p.

Opitz, S. 1996. Trophic interactions in Caribbean coral reefs. *ICLARM Technical Reports* 43: 1-341.

Randall, J.E. 1967. Food habits of reef fishes of the West Indies. *Studies in Tropical Oceanography* 5: 665-847.

Randall, J.E. 1996. *Caribbean Reef Fish.* 3rd ed. Neptune City: T.F.H. Publ., Inc. 368 p.

Sale, P.F. 1991. *The ecology of fishes on coral reefs*. San Diego: Academic Press, 754 p.

Spach, H.L., R.S. Godefroid, C. Santos, R. Schwarz-Jr. and G.L.M. Queiroz. 2004. Temporal variation in fish assemblage composition on a tidal flat. *Brazilian Journal of Oceanography* 52(1): 47-58.

Spalding, M.D., C.E. Ravilious and P. Green. 2001. *World atlas of coral reefs.* Berkeley: University of California Press, 421 p.

Vendel, A.L., S.G. Lopes, C. Santos and H.L. Spach. 2003. Fish assemblages in a tidal flat. *Brazilian Archives of Biology and Technology* 46(2): 233-242.

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